

IN THE CLAIMS:

1. An apparatus to measure micro-forces, comprising:  
a cantilever palette including a plurality of cantilever array blocks, each  
5 cantilever array block including a plurality of cantilevers, each cantilever including a  
plurality of cantilever fingers surrounded by a frame with frame fingers, said  
cantilever fingers and said frame fingers forming a diffraction grating, each cantilever  
array block being configured to be responsive to a predetermined micro-force, such  
that cantilevers of said cantilever array block deflect in the presence of said  
10 predetermined micro-force causing said diffraction grating to diffract light and thereby  
provide visual indicia of the presence of said predetermined micro-force.
2. The apparatus of claim 1 wherein said predetermined micro-force is a  
chemical-mechanical force created by the presence of a predetermined substance.  
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3. The apparatus of claim 2 wherein said predetermined micro-force is a  
chemical-mechanical force created by the presence of a predetermined chemical.
4. The apparatus of claim 1 wherein said predetermined micro-force is a  
20 chemical-mechanical force created by an antibody-antigen interaction.
5. The apparatus of claim 2 wherein each cantilever array block of said plurality  
of cantilever array blocks is configured to be responsive to a different predetermined  
substance.  
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6. The apparatus of claim 2 wherein each cantilever array block of said plurality  
of cantilever array blocks is configured to be responsive to a predetermined level of a  
single predetermined substance.
- 30 7. The apparatus of claim 2 wherein said plurality of cantilever array blocks  
includes cantilever array block subsets, each cantilever array block subset being  
configured to be responsive to a different predetermined substance, and each cantilever

array block within each cantilever array block subset being configured to be responsive to a predetermined level of said predetermined substance.

8. The apparatus of claim 1 wherein cantilever array blocks of said cantilever  
5 palette are configured to be responsive to a predetermined micro-force that is a thermal-mechanical micro-force arising from conduction, convection, or radiation.

9. The apparatus of claim 1 wherein cantilever array blocks of said cantilever  
10 palette are configured to be responsive to a predetermined micro-force that is a magnetic micro-force.

10. The apparatus of claim 1 wherein cantilever array blocks of said cantilever  
15 palette are configured to be responsive to a predetermined micro-force that is an electrostatic micro-force.

11. The apparatus of claim 1 wherein cantilever array blocks of said cantilever  
palette are configured to be responsive to a predetermined micro-force that is a piezoelectric micro-force.

20 12. The apparatus of claim 1 further comprising image enhancement devices selected from the group consisting of: a beam splitter, a visible lens, and a spatial filter.

25 13. The apparatus of claim 1 further comprising a pin hole array attached to said cantilever palette.

14. A method of identifying micro-forces, said method comprising the steps of:  
forming a cantilever palette including a plurality of cantilever array blocks,  
each cantilever array block including a plurality of cantilevers, each cantilever  
30 including a plurality of cantilever fingers surrounded by a frame with frame fingers,  
said cantilever fingers and said frame fingers forming a diffraction grating, each

cantilever array block being configured to be responsive to a predetermined micro-force;

exposing said cantilever palette to said predetermined micro-force, thereby causing cantilevers of said cantilever array block to deflect such that said diffraction grating produces diffracted light; and

visually observing said diffracted light from said diffraction grating to identify the presence of said predetermined micro-force.

15. The method of claim 14 wherein said forming step includes the step of forming said cantilever palette to be responsive to a predetermined micro-force that is a chemical-mechanical force created by the presence of a predetermined substance.

16. The method of claim 15 wherein said forming step includes the step of forming each cantilever array block of said plurality of cantilever array blocks to be responsive to a different predetermined substance.

17. The method of claim 15 wherein said forming step includes the step of forming each cantilever array block of said plurality of cantilever array blocks to be responsive to a predetermined level of a single predetermined substance.

18. The method of claim 15 wherein said forming step includes the step of forming cantilever array block subsets, each cantilever array block subset being configured to be responsive to a different predetermined substance, and each cantilever array block within each cantilever array block subset being configured to be responsive to a predetermined level of said predetermined substance.

19. The method of claim 14 wherein said forming step includes the step of forming said cantilever palette to be responsive to a predetermined micro-force that is a thermal micro-force.

20. The method of claim 14 wherein said forming step includes the step of forming said cantilever palette to be responsive to a predetermined micro-force that is a magnetic micro-force.

- 5 21. The method of claim 14 wherein said forming step includes the step of forming said cantilever palette to be responsive to a predetermined micro-force that is an electrostatic micro-force.

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